



United States Department of Agriculture, Forest Service

Forest Plan Amendment for Bat Conservation

Environmental Assessment

Ozark-St. Francis National Forests, Arkansas

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Cover Photos (left to right): Indiana bat, tri-colored bat, and Ozark big-eared bat

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Table of Contents

Introduction	2
Proposed Project Location	2
Need for the Proposal	3
Public Involvement and Tribal Consultation.....	3
No Action (Current Forest Plan) and Proposed Action	6
Environmental Impacts of the Proposed Action.....	13
Effects Common to All Resources	13
Resources Dismissed from Further Analysis	13
Heritage Resources	13
Climate	14
Road Maintenance	14
Recreation.....	14
Resources with Direct and Indirect Effects (including Cumulative)	14
Soil and Water	14
Vegetation Management.....	15
Wildlife.....	16
Addressing 36 CFR 219 Planning Rule Requirements	27
References	28
APPENDIX A	A-1

List of Tables

Table 1. Descriptions of No Action, Proposed Action and Need for Change	6
Table 2. Number of Bat Mist-net Survey Sites Conducted on the OSFNFs, 2006 to 2019	18
Table 3. Indiana Bat Roost Tree Status on the OSFNFs in 2019	20
Table A-1. Comparison of Effects of Forest Plan Implementation on ESA-listed species based on Current Forest Plan Language (No Action Alternative) and Amended (Proposed Action)	A-2
Table A-2. Impacts of Forest Plan implementation on Regional Forester's Sensitive Species.....	A-4

List of Figures

Figure 1. Ozark-St. Francis National Forests' Vicinity Map and Indiana Bat Conservation Zones within the Project Area	4
Figure 2. Bat Mist-Net Survey Sites, 2006 to 2019.....	19

Introduction

The Ozark-St. Francis National Forests (OSFNFs) are proposing to amend the 2005 Revised Land and Resource Management Plan (Forest Plan) (US Department of Agriculture (USDA) Forest Service, 2005b). This environmental assessment (EA) has been prepared to determine whether implementation of the plan amendment may significantly affect the quality of the human environment, and thereby require the preparation of an environmental impact statement. By preparing this EA, we are fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA). The proposed action would update elements of the Forest Plan. Updates would include new definitions that provide clarity to elements relating to threatened and endangered bat species on the OSFNFs. Forest Plan changes would also include updating, adding and deleting forest-wide standards, updating the silvicultural prescription for the Indiana bat conservation zones¹, and adding a bat monitoring requirement to the Forest Plan monitoring strategy. This amendment is limited to the elements of the plan related directly to bat conservation and is not intended as a major change to the current management approach described in the Forest Plan. No changes were made to numbers of acres approved for desired age class distribution or timber harvest. This is a programmatic document, and decisions on any new projects that implement the Forest Plan would continue to have site-specific analyses completed that tier to the Forest Plan.

Proposed Project Location

The project area is located on National Forest System lands within the proclamation boundary of the OSFNFs. The OSFNFs include approximately 1.2 million acres of federally-managed public land in the Ozark Highlands, Arkansas River Valley, Alluvial Plain and Crowley's Ridge areas of Arkansas. The OSFNFs are divided into six ranger districts located in 18 counties. The Ozark National Forest is located in northwest and north central Arkansas in Baxter, Benton, Conway, Crawford, Franklin, Johnson, Logan, Madison, Marion, Newton, Pope, Searcy, Stone, Van Buren, Washington, and Yell Counties. The St. Francis National Forest is located in eastern Arkansas next to the St. Francis and Mississippi Rivers, in Lee and Phillips Counties. The OSFNFs are managed under a Forest Plan (USDA Forest Service, 2005b), as amended. Management activities in the Forest Plan and addressed in this amendment can only take place on public lands within the Forest Service proclamation boundaries. The proposed amendment would not affect private lands adjacent to or within the proclamation boundary of the OSFNFs.

The OSFNFs are located within the Ozark-Ouachita, Arkansas River Valley, and Mississippi Alluvial Valley provinces. Elevations range from approximately 160 to 2,753 feet. A highly dissected plateau with relatively flat tops and steep hillsides characterizes the topography in the Ozark Plateau and Arkansas River Valley Provinces. Crowley's Ridge, a wind-blown deposit that

¹ Indiana bat conservation zones are areas within the Forest Service proclamation boundary, as defined in the Forest Plan, forest-wide standard 62: Indiana bat secondary conservation zone includes lands within a five-mile radius surrounding a hibernaculum. Indiana bat primary conservation zone includes lands within a one-quarter mile radius surrounding a hibernaculum. Indiana bat conservation zones provide management direction for these areas on the Ozark-St. Francis National Forests, including setting target habitat conditions, such as canopy closure levels and forest composition.

contains deep soils on a highly erodible ridge with steep hillsides, covers the St-Francis National Forest, along with a portion of the Forest being in the Mississippi River floodplain.

Need for the Proposal

Since the Forest Plan was signed, new information has been collected related to the distribution and habitat use patterns of bats on the OSFNFs, research has been published that addresses the relationship between forest management and bat conservation, and white-nose syndrome has been found in caves across north Arkansas and substantially affected populations of some bat species on the OSFNFs. These aspects have combined to create circumstances where the Forest Plan's direction needs to be updated. There is also a need to update the assessment of effects that implementation of the forest-wide standards would have on threatened and endangered species, specifically the Indiana bat, known to exist on or near the OSFNFs, to incorporate changes proposed in the plan amendment. This EA and associated Biological Assessment (BA) will reinitiate consultation for the Indiana Bat (*Myotis sodalis*) due to additional information about the habitat use of the species on the OSFNFs and provide an updated Endangered Species Act (ESA) consultation for that species, based on the plan amendment. The proposed plan amendment will apply to all Forest Service lands in the OSFNFs as shown in the vicinity map (Figure 1).

Public Involvement and Tribal Consultation

The project was first listed in the Schedule of Proposed Actions on April 2, 2019. In May 2019, two public meetings were held to discuss the need for this plan amendment, scientific information, and monitoring results from the OSFNFs. Attendees were given information on the draft proposed action, need for change, and the NEPA and National Forest Management Act (NFMA) processes. A legal notice was published in four newspapers across the OSFNFs: the *Russellville Courier* on April 14, 2019, the *Johnson County Graphic* on April 17, 2019, the *Southwest Times Record* on April 14, 2019 and the *Stone County Leader* on April 17, 2019 initiating scoping. A total of 26 comments were received. The proposed action was modified to incorporate relevant suggestions and concerns brought forward from internal and external scoping.

The Forest Service consulted the following Federal, State, Tribal, and local agencies during the development of this EA:

U.S. Fish and Wildlife Service	Muscogee (Creek) Nation
Arkansas Game and Fish Commission	Eastern Shawnee Tribe
Arkansas Natural Heritage Commission	Jena Band of Choctaw Indians
Southern Research Station, U.S. Forest Service	Osage Nation
Arkansas State Historic Preservation Officer	Quapaw Tribe
Absentee Shawnee Tribe	Shawnee Tribe
Caddo Tribe	Thlopthlocco Tribal Town
Cherokee Nation	United Keetoowah Band of Cherokee
Choctaw Nation	Wichita and Affiliated Tribes

Delaware Nation

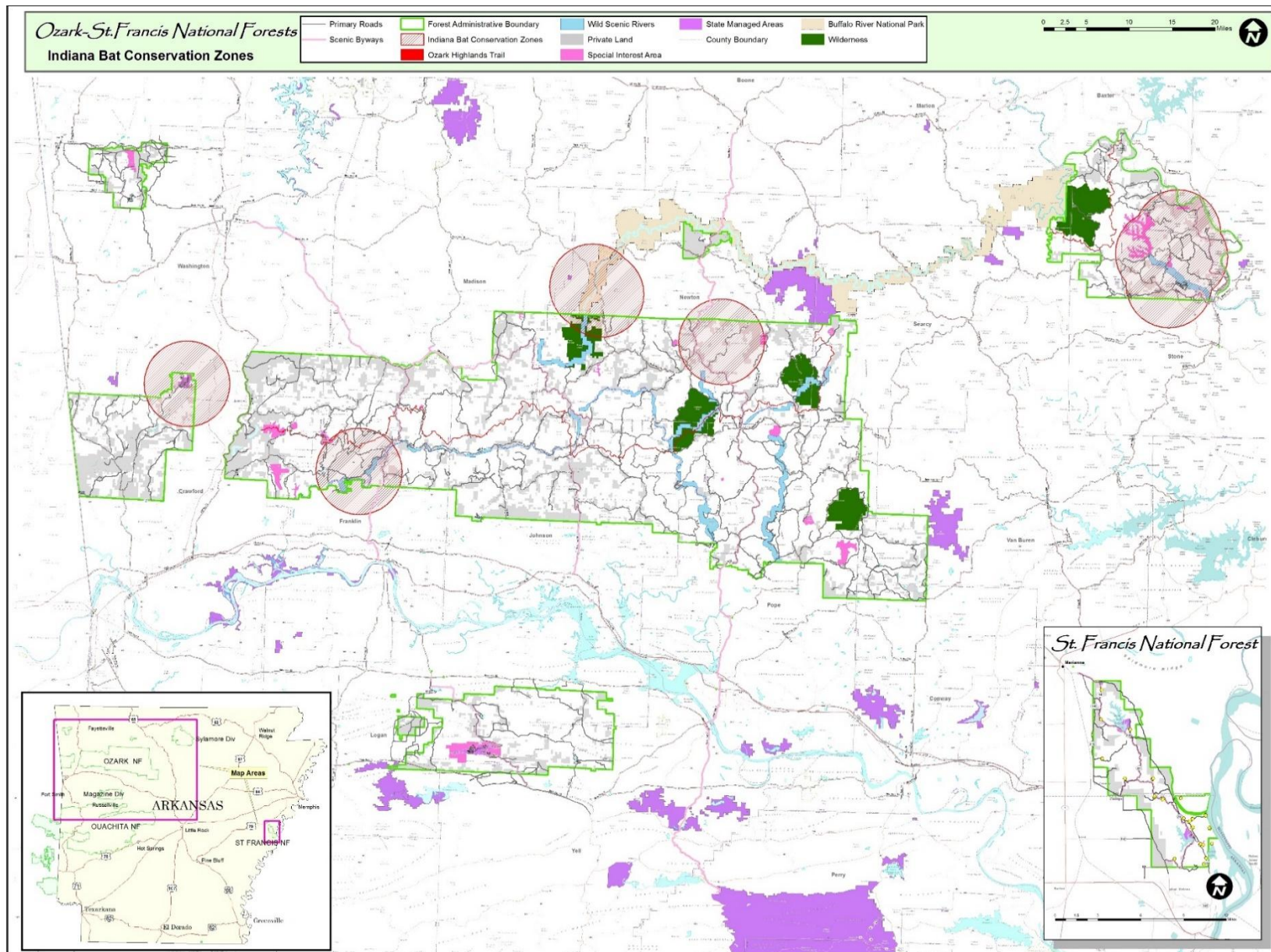


Figure 1. Ozark-St. Francis National Forests' Vicinity Map and Indiana Bat Conservation Zones within the Project Area

No Action (Current Forest Plan) and Proposed Action

When the need for a Forest Plan amendment became necessary to address bat species, the Forest Service evaluated what aspects of the Forest Plan required changes. This was done internally within the Forest Service, and also in conjunction with the U.S. Fish and Wildlife Service (USFWS) and other partners. The result of these efforts are multiple proposed changes to the Forest Plan (Table 1). All of the changes are proposed together to update protections and management for bat species across the Forest landscape. Since this Forest Plan amendment is a programmatic action to comprehensively better manage Forest species, no additional alternatives were considered.

The implementation of the proposed changes to the forest-wide standards and silvicultural prescription for Indiana bat conservation zones in the Forest Plan would be carried forward into all planned future projects and activities (including those that are covered by existing NEPA decisions, but not yet implemented on the ground or contracted for implementation) to protect bat species on the OSFNFs. The proposed changes to the forest-wide standards and silvicultural prescription would not apply to any project or activity that has a previous commitment, documented in an agreement or contract, at the time the NEPA process for this amendment is completed and a decision document is signed unless the agreement or contract is modified through mutual agreement by both parties to fully meet the proposed changes.

Table 1. Descriptions of No Action, Proposed Action and Need for Change

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
Forest-Wide Standard (FW) 48	<p>Optimal overstory density within the secondary zone around Indiana bat hibernacula is a range of 50 to 70 percent canopy closure. Use timber harvest, non-commercial thinning, and prescribed fire as needed to regulate and maintain this optimal density.</p> <p>During normal order of entry for compartments within Indiana bat secondary conservation zones, do landscape scale analysis of existing forest stand conditions. This analysis should be used to determine commercial and non-commercial treatments needed to shift percent canopy closure toward the optimal overstory density. The long-term goal of treatments is to adjust canopy closure so that 80 to 90 percent of</p>	<p>Optimal overstory density within the secondary zone around Indiana bat hibernacula is a range of 50 to 70 percent canopy closure. Use timber harvest, non-commercial thinning, and prescribed fire as needed to regulate and maintain this optimal density.</p> <p>During normal order of entry for compartments within Indiana bat secondary conservation zones, do landscape scale analysis of existing forest stand conditions. This analysis should be used to determine commercial and non-commercial treatments needed to shift percent canopy closure toward the optimal overstory density. The long-term goal of treatments is to adjust canopy closure so that 80 to 90 percent of</p>	<p>This is a clerical correction. In the second paragraph, there is a reference to the primary Indiana bat conservation zone, which is addressed in detail in FW 47. FW 48 is intended to address the secondary Indiana bat conservation zone prescription.</p>

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
	<p>the <i>primary</i> conservation zone is within the 50 to 70 percent canopy closure range. This will not be fully accomplished during this planning period. Annually report canopy cover adjustments accomplished with commercial and non-commercial treatments within Indiana bat conservation zones to the Arkansas Field Office, U.S. Fish and Wildlife Service (USFWS).</p> <p>When designating trees to be cut to regulate overstory density, two approaches are recommended for equating canopy density to target leave basal area. A simple rule of thumb is to use site index minus 10 as the target leave basal area. Another option is the use of canopy density/basal area conversion charts defined by tree diameter classes.</p>	<p>the <i>secondary</i> conservation zone is within the 50 to 70 percent canopy closure range. This will not be fully accomplished during this planning period. Annually report canopy cover adjustments accomplished with commercial and non-commercial treatments within Indiana bat conservation zones to the Arkansas Field Office, USFWS.</p> <p>When designating trees to be cut to regulate overstory density, two approaches are recommended for equating canopy density to target leave basal area. A simple rule of thumb is to use site index minus 10 as the target leave basal area. Another option is the use of canopy density/basal area conversion charts defined by tree diameter classes.</p>	
FW 52	<p>Prescribed burn plans for areas containing caves or for areas near significant caves or mines will identify these sites as smoke sensitive targets. The prescribed burn plans will be written to <i>avoid</i> active combustion and smoldering phase smoke from entering these sites when bats are present.</p>	<p>Prescribed burn plans for areas containing caves or for areas near significant caves or mines will identify these sites as smoke sensitive targets. The prescribed burn plans will be written to <i>minimize</i> active combustion and smoldering phase smoke from entering these sites when bats are present.</p>	<p>This change in wording clarifies that some smoke could enter caves during prescribed burns, but those sites would be managed to prevent heavy smoke from entering caves. Prescribed fire has beneficial effects to Indiana bat habitat. Heavy smoke accumulation in the cave could have detrimental effects to bats, but Indiana bats typically roost in cold air traps, so air exchange is limited and smoke accumulation risk is low. Sampling in sandstone crevices during prescribed fires has found that some smoke can enter the caves, but heavy smoke accumulation has not been observed.</p>

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
FW 64	Project specific informal consultation will be done for all activities proposed within primary conservation zones. No disturbance that will result in potential taking of an Indiana bat will occur.	All activities proposed within primary Indiana bat conservation zones will be coordinated with the USFWS and conservation and recovery of the Indiana bat will be the management priority for those actions.	Triggers for consultation are established by the Endangered Species Act. In some cases, the risk of take is a consequence of management to improve habitat and species recovery actions, even when there is a net benefit to the population. However, it is important that the Forest is closely coordinating activities with USFWS that are occurring within the designated primary conservation zones for Indiana bat.
FW 66	Tree cutting and prescribed fires are prohibited in the primary and secondary Indiana bat zones between (April 1) and November 30. Adjustments to these dates may be made on a project-specific basis through coordination with the Arkansas Field Office, USFWS. Site-specific inventories are good for two calendar years from the date of survey completion.	Cutting of potential Indiana bat roost trees (trees three inches or greater diameter at breast height) is restricted from August 15 to November 30 in primary Indiana bat conservation zones and in Indiana bat priority roosting zones for caves with fall swarming Indiana bats. Cutting of potential Indiana bat roost trees as described above is also restricted from March 1 to April 30 in the primary Indiana bat conservation zones for caves with hibernating Indiana bats. Indiana bat priority roosting zones are mapped in coordination with USFWS based on habitat quality and bat use patterns around caves with the intent of protecting core use areas encompassing a minimum of 100 acres per Indiana bat hibernaculum. Management activities within the priority roosting zones would emphasize Indiana bat roosting habitat and ensure a continual supply of quality roosting trees.	This standard was designed to ensure site-specific surveys for Indiana bats within the Indiana bat conservation zones. Occupied areas have been protected, however, monitoring has demonstrated that Indiana bats tend to change habitat locations both within seasons and between seasons, so the bats may often be outside of the protected areas. Monitoring efforts have found patterns of habitat use by Indiana bats, but it is also clear that it is not practical to know where individual bats will be during project implementation. There is a need to focus the protections on the areas and during the time periods that the bats are typically at higher densities. Data suggests that Indiana bat density is low in the Indiana bat conservation zones through the summer. Indiana bats use areas around the hibernacula during the spring emergence and fall swarming period at a higher density. Timing

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
			restrictions for prescribed fire within the primary and secondary Indiana bat conservation zones would be removed, because the risk of negative impacts to tree-roosting bats from prescribed fire is low, and there are numerous habitat benefits from prescribed burning. Timing restrictions for tree cutting within the primary and secondary Indiana bat zones are modified. Timing restrictions that cover the entire secondary Indiana bat conservation zone for the active season are lifted. Timing restrictions are maintained in the primary Indiana bat conservation zone during the spring emergence and fall swarming period and in the priority roosting zones during the fall swarming period. Priority roosting zones would be newly mapped areas that would be based on known bat use and high quality habitat near hibernacula. The priority roosting zones could change over time based on new information or changed conditions when coordinated with USFWS.
FW 67	Tree cutting and salvage operations can occur between December 1 and March 15 without a site-specific inventory. Additional coordination with USFWS is not required.	Remove forest-wide standard	There would not be a need for this standard with the proposed changes to FW66. Triggers for consultation are established by the Endangered Species Act.
FW 69	In the secondary zone buffer around Indiana bat hibernacula, live trees or snags, buildings, and other structures known to have been used as roosts by Indiana bats are	Live trees, snags, buildings, and other structures known to have been used as roosts by Indiana bats and female northern long-eared bats are protected from cutting	Expands the protection of roosting structures, including trees and snags, from the secondary Indiana bat conservation zone to the entire Forest.

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
	protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the USFWS.	and/or intentional modification until they are no longer suitable as a roosting structure (trees no longer standing) unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it must be coordinated with the USFWS. Prescribed burns may proceed without special protection for roost trees except for active Indiana bat maternity trees.	Protects roosts for female northern long-eared bats as well as Indiana bats. Clarifies that the protections apply to cutting or direct modification, but not to prescribed fire.
FW 71	A 200-foot buffer of undisturbed forest will be maintained around gray bat maternity and hibernation colony sites, Ozark big-eared bat maternity sites, bachelor sites, or winter colony sites. Prohibited activities within this buffer include cutting of overstory vegetation; construction of roads, trails, or wildlife openings or development of pastures; and prescribed burning. Exceptions may be made where coordination with USFWS determines these activities to be compatible with recovery of these species.	Protections are established around gray bat maternity and hibernation colony sites and Ozark big-eared bat maternity sites, bachelor sites, and winter colony sites. Cutting of overstory vegetation is prohibited within a 200-foot buffer around these sites. Within ¼ mile of the sites, there will be no new permanent development, such as construction of roads, trails, wildlife openings, pastures or special use right of ways unless required to access private property. Exceptions may be made where coordination with USFWS determines these activities to be compatible with recovery of these species.	The existing 200-foot buffer is maintained for forest management activities that may improve habitat conditions or forest health, but permanent developments or conversion from forest in the vicinity surrounding maternity, bachelor, or hibernation sites may have long-term detrimental effects on the habitat for endangered bats. Prescribed fire may be applied within 200 feet, but the site would be managed as a smoke-sensitive target as described in revised FW52.
New	N/A – New proposed standard	If Indiana bat maternity trees are discovered within the OSFNFs, those trees and other trees used by the colony would be protected. No tree falling would occur within 150 feet of known maternity trees unless their cutting or modification is needed to protect public or employee safety. Where tree cutting or modification is deemed necessary within this area, it must be coordinated with the	Although no maternity sites have been found on the Forest, they have been found to occur in Arkansas and evidence suggests that sites occur to the south, east, and west of the OSFNFs. Establishing the protocol for protection in anticipation of discovering a maternity colony will assure that the proper protective measures are in place and will

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
		USFWS. Prior to prescribed fire, fuels would be removed from around known maternity trees to prevent damage during the burn. During the maternity period (April 1 to August 15), activities that may disturb the colonies, such as timber harvest, use of heavy equipment, and prescribed fire would be prohibited in an area approximately ¼ mile from known maternity roost trees. Variation in the buffer distance would be coordinated with USFWS and may include type of activity or topography that would shield the maternity site from the disturbance. Efforts would be made to determine the location of roost trees used by the colony prior to proceeding with forest management in the vicinity of the colony. If it is determined with USFWS that the colony has abandoned the site, the protections are no longer required except to maintain known roost trees, as per revised FW69.	not delay project implementation if one is found.
Appendix A Definitions	New	Roost tree – A live tree or snag used as a day roosting structure by one or more bats.	
Appendix A Definitions	New	Maternity tree – A live tree or snag used as a roost by a pregnant or lactating female bat or bat pups. Use by a female during the maternity season, even without evidence of reproductive status, will be assumed maternity use.	
Appendix F, Silvicultural Rx #110	110 Indiana Bat – The purpose of this prescription is to maintain or enhance the habitat for Indiana Bats. Commercial thin on a regular basis to 30 sq ft of BA per acre and	110 Indiana Bat – The purpose of this prescription is to maintain or enhance habitat for Indiana bats. Follow guidelines set forth in forest-wide standards 33, 47, 48,	Updates and clarifies the silviculture prescription used in the Indiana bat conservation zones to benefit habitat for Indiana bat. Changes the primary

Forest Plan Component	No Action (2005 Forest Plan)	Proposed Action (Forest Plan as Amended)	Need for Change
	harvest at 140 to 160 yrs. with a 2-step shelterwood. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, remove the remaining overstory. Follow guidelines set forth in the forest-wide standards for Indiana Bat management. Begin prescribed burning in these areas and repeat on a 3- to 5-year schedule. Following the shelterwood harvest, adequate oak regeneration should be present to re-stock the stand with 300+ trees/acre. Delay burning in the regenerated stand for 10 years to give the oaks time to become established. Upon regeneration establishment, resume burning and commercial thinning.	68, 69, and 70 for Indiana Bat management. Manage the diverse landscapes within the Indiana bat conservation zones with silviculture prescriptions 103, 104, 106, 113, or 114. Thin to maintain target canopy closure and regenerate stands using harvest methods with leave tree reserves, retaining overstory trees to provide high-quality roost trees over time. If needed, girdle select leave trees to maintain sufficient high-quality roost trees. Manage prescribed burning intervals to reduce mid-story clutter and promote groundcover to improve bat foraging conditions; some longer intervals may be needed to promote natural regeneration to attain desired tree composition, spacing and canopy closure. Management of rare habitats, such as glades and cane breaks within Indiana bat conservation zones, require specialized management strategies not described in the silvicultural prescriptions.	regeneration harvest method from shelterwood to regeneration harvest with leave tree reserves to help provide high-quality roost trees.
Appendix I Monitoring: Table I-2, Monitoring Summary Table Mandatory Items	N/A – New proposed monitoring	Monitoring Need – Threatened, Endangered, and Sensitive bat populations and habitat utilization are monitored. Long-term population trends, species distributions and habitat use patterns are monitored to inform management strategies. Measurement frequency: Annual Reporting frequency: 2 years Precision and reliability: High	With three endangered, one threatened and four Regional Forester's Sensitive listed bats, the health and recovery of bat populations is a key indicator of the success of the Forest Plan.

Environmental Impacts of the Proposed Action

This section summarizes the potential impacts for each impacted resource as a result of the proposed action. Projects implemented under the 2005 Forest Plan would continue to have site-specific analyses of effects to resources for each project.

Effects Common to All Resources

The scope of this amendment is a programmatic change to the Forest Plan. Because it is a change to the plan, there would be no direct effects. The changes, however, would affect some aspects of project implementation. The amendment is limited to standards, definitions, a silvicultural prescription and monitoring specific to bat conservation and bat population management and monitoring. Vegetation, transportation, recreation, and ecosystem management elements described in the plan would largely remain unchanged. In limited circumstances, such as near Indiana bat hibernacula, the timing of activities may be altered, but the types and extent of activities conducted under the Forest Plan would not change. Because of the limited scope of this amendment, there would be very limited effects when considered at the forest-scale to resources other than wildlife resources.

Those limited areas in which the proposed action could affect other resources would be site-specific. Protection would be added to Indiana bat and female northern long-eared bat roost trees from cutting wherever they were found on the OSFNFs. There would be additional timing restrictions in the vicinity of Indiana bat maternity sites if they are found on the Forest. Currently, the plan has broad timing restrictions to tree cutting and prescribed fire within the Indiana bat conservation zones, which can be waived with site-specific surveys that don't detect Indiana bats. Currently, Indiana bats caught during surveys are radio-tagged, and active-season timing restrictions to tree cutting and prescribed fire are applied for a 0.6-mile radius around capture sites and roost trees for two years, until the next round of surveys. These procedures would be replaced by applying seasonal restrictions to cutting in designated fall roosting and spring emergence areas around hibernacula. The amendment would also alter the Indiana bat conservation zone silvicultural prescription #110, allowing broader forest management options to address a diverse array of stand composition and age class conditions, and requiring that overstory reserve trees within regeneration stands not be harvested in a second cut. The amendment would also provide extended protections from permanent developments around maternity and hibernacula sites for Ozark big-eared bat and gray bats.

The changes are expected to benefit bat populations, but are only expected to have limited and minimal effects to the other resources managed on the OSFNFs.

Resources Dismissed from Further Analysis

Heritage Resources

The OSFNFs' Heritage Program is concerned with the management of cultural resources, which includes both structures over 50 years old and historic and pre-contact archeological sites. Management of sites and structures can require several types of activities including identification, active protection, and sometimes full excavation of archaeological sites. Effects on heritage properties are analyzed at the project level through the National Historic Preservation Act, Section 106 process due to the level of project specificity required to complete these consultations. As this is a programmatic analysis relating to an amendment to the Forest Plan, and

administrative in purpose only, no specific projects are considered in this analysis for implementation. Therefore, effects to heritage properties have been dismissed from further analysis.

Climate

The proposed action is a programmatic decision which clarifies definitions and forest-wide standards for species protection during Forest management activities, and clarifies times of year in which activities can be done. A complete and quantitative assessment of forest carbon stocks and the factors that influence carbon trends (management activities, disturbances, and environmental factors) for the OSFNFs is available in the project record (Dugan *et al.*, 2019). The proposed action is not likely to have a measurable effect to carbon storage on the OSFNFs, or to global pools of greenhouse gases. Therefore, climate effects have been dismissed from further analysis.

Road Maintenance

The proposed action would result in slight changes to restrictions on road maintenance activities that involve tree removal within Indiana bat conservation zones. Since restrictions would not be dependent on survey results, there would be some additional predictability in planning road maintenance projects. Changes would be minimal, and would not affect the ability of the Forest Service to accomplish road maintenance activities where necessary, and would not change the effects of road maintenance across the OSFNFs. Therefore, effects of road maintenance activities are not considered for further analysis.

Recreation

The proposed Forest Plan amendment would not result in any impacts to recreation opportunities on the OSFNFs. The amendment addresses updated forest-wide standards for treatments and activities, which would not change how recreation opportunities are supported on the Forest. The updated standards and clarifications are likely have a slightly positive effect on the ability to maintain recreation sites and trails throughout the OSFNFs. It would provide some operational flexibility, allowing quicker responses to problem areas, which would result in reduced impacts on associated natural resources. These effects are very minimal to recreation on the OSFNFs. Therefore, these effects are dismissed from further analysis.

Resources with Potential Effects

Soil and Water

The analysis area for soil and water resources is throughout the OSFNFs; however, most effects are expected within the Indiana bat conservation zones. Overall, the effects to soil and water would be very similar to the no action alternative. The changes to the timing restrictions near Indiana bat hibernacula would allow additional predictability in project implementation for timber harvest, prescribed fire, and other projects that require tree cutting, because the timing restrictions would not be dependent upon survey results. Projects in the primary Indiana bat conservation zones could be conducted either in the winter months, December 1 to February 29, or summer months, May 1 to August 14. The timing flexibility for implementing management actions would increase the amount of dry-weather periods available for project implementation, which could reduce harvesting and other ground-disturbing activities in wet weather. This may allow some projects to be conducted during drier weather periods, which would decrease erosion and compaction and reduce potential stream sedimentation. The soil and water protections in the

Forest Plan and in the Arkansas Forestry Commission's forestry Best Management Practices would apply to the proposed action.

Effects – Proposed Action

Currently, tree cutting or prescribed fire that occurs within the Indiana bat conservation zones where Indiana bats have not been surveyed or have been found to be present would only be allowed to occur from December 1 to March 31. Because that is a limited window and can be a relatively wet period, there is some increased risk that equipment operation would occur during wetter conditions, causing rutting and compaction. Under the proposed action, much of the secondary Indiana bat conservation zones would not have a timing restriction; most timing restricted areas would still have the same winter timing available, as well as a summer period. The proposed action may decrease negative soil and water effects on a localized and watershed basis because timber harvest, prescribed burning and other ground-disturbing management activities could be planned to occur in drier months and during the growing season when vegetative cover is reestablished sooner than in winter months. Project implementation during long dry periods reduces the potential for soil erosion and long-term soil compaction. Direct and indirect effects of the proposed action are limited due to the nature of the proposed Forest Plan amendments, which do not include authorization of any ground-disturbing activities. Further discussion of impacts to aquatic species from erosion and sedimentation can be found in the aquatic species section.

Cumulative Effects

By reducing the stream sedimentation from Forest Service lands, the potential cumulative sedimentation in streams would be reduced. This assumes that more sediment-generating activities would occur in drier months, Best Management Practices are correctly implemented, and ground-disturbing activities are within the 2005 Forest Plan projected levels.

Over time as projects occur in a dry season, it should maintain the soils' native productive potential to grow vegetation. It should also potentially decrease the recovery time of previously damaged soils. The proposed action does not change standard Best Management Practices used to reduce non-point source pollution from erosion, nor is there a change in the protections for riparian buffer areas in harvest units.

Summary

Based on the above analysis, implementation of the proposed action components to amend the Forest Plan would have no significant effects on soil and water resources across the Forest landscape. The proposed action would have no direct, indirect or cumulative impacts to soil and water since no site-specific, ground disturbing activities are authorized in this decision.

Vegetation Management

The analysis area for vegetation is throughout the OSFNFs. The proposed changes to the Forest Plan do not directly authorize any vegetation management activities to take place, and therefore, would have no direct effects on vegetation management within the OSFNFs. The proposed changes to the Forest Plan would modify the way seasonal restrictions on vegetation management activities would be managed to protect bats. Currently, extensive bat netting is conducted and, because of the low density of Indiana bats, most of the areas are cleared from timing restrictions. Where Indiana bats are captured, timing of vegetation management activities are restricted to the hibernation period. This change would allow better information for planning vegetation

management activities since the restrictions would be known without the need for site-specific surveys.

Effects – Proposed Action

Vegetation management activities on the Forest support bat populations by improving habitat, and enhancing habitat for many prey species, such as insects, that the bats depend on. The proposed changes to timing restrictions would result in improved ability to plan for and implement projects that fall within the Indiana bat conservation zones, since those restrictions would not be dependent upon survey results. Projects in the primary Indiana bat conservation zones and the priority roosting zones would be more time-restricted compared to the current standards, unless an Indiana bat was caught during surveys. However, having a summer and a winter season should be sufficient to implement projects. The changes to the Indiana bat conservation zone silvicultural prescriptions would improve the flexibility to manage stands at different conditions and ages. Regeneration harvest would include reserve trees, which would not be available for harvest, however, the overstory removal cuts are not typically required to achieve desired stand regeneration. Direct and indirect effects of the proposed action are limited due to the nature of the proposed Forest Plan amendments, which do not include authorization of any ground-disturbing activities. Further discussion of impacts to bat habitats from vegetation management activities are discussed in the Wildlife section.

Cumulative Effects

Vegetation management activities covered by this programmatic plan amendment can only be conducted on U.S. Forest Service lands. Cumulative effects to vegetation management within the project area would not change as a result of the proposed Forest Plan amendment.

Summary

Based on the above analysis, implementation of the proposed action components to amend the Forest Plan would have no significant effects on vegetation management across the Forest landscape. The proposed action would have limited direct, indirect or cumulative impacts to vegetation since no site-specific, ground disturbing activities are authorized in this decision.

Wildlife

Bats

Background

The OSFNFs have monitored bat activity on the forests over 20 years using summer mist-netting, acoustic recordings, radio telemetry, and hibernacula surveys. We have gained substantial information on the distribution, abundance and habitat use of species across the OSFNFs. The result has been the identification of hibernacula, roost trees, and foraging areas of the many bat species that live on the OSFNFs. The information from those investigations have contributed to the development of the current plan amendment proposal.

Indiana Bat – (*Myotis sodalis*) - Endangered

Indiana bats range across much of the eastern United States, and Arkansas' population is near the southern and western extent of the species range. The range-wide population has been declining since the arrival of white-nose syndrome, but that decline has not been as dramatic as observed in some other species that are susceptible to the disease. The range-wide population estimate for the species is 537,297, and the most recent estimate of the Arkansas population is estimated to be

2,749 (King, 2019). Although the Arkansas estimate is up from prior years, the recent discovery of additional hibernation areas is likely obscuring a trend that more closely matches the range-wide decline.

Indiana bats hibernate during winter in caves or mines. During summer, they roost under the peeling bark of trees. The bats typically prey on flying insects. They forage along river and lake shorelines, in the crowns of trees in floodplains, and in upland forest. They forage in riparian areas, upland forests, and above ponds and fields. Male and female bats have different patterns. Males and non-reproductive females are believed to typically stay near winter hibernacula, traveling only limited distances to foraging habitats, whereas reproductive females have been found to migrate, in some cases long-distances, to maternity roosting habitat (USFWS, 2007; Roby, 2019).

Fall Swarming (August 15 to November 30)

There have been multiple bat surveys completed on the OSFNFs during the fall swarming period, resulting in the identification of several fall swarming sites. In general, most of the Indiana bats roosted at sites within five kilometers (km) of the swarming area, with a mean distance to roost sites of 2.36 km (Perry *et al.*, 2016). The surveys indicated that shortleaf pine (*Pinus echinata*) and shagbark hickory (*Carya ovata*) were preferred roosting trees, as were trees greater than 20 centimeters (cm) diameter at breast height (dbh), but that bats roosted in a wide range of species and sizes of trees (Perry *et al.*, 2016).

Winter Hibernation (December 1 to February 29)

Indiana bats have very specific requirements for cave hibernating habitat, and although there are approximately 500 cave features on the OSFNFs, Indiana bats are known to inhabit only 10 of these caves; located on the Sylamore, Big Piney, and Boston Mountain ranger districts. There are an additional three known hibernacula located on lands nearby the OSFNFs, one in Washington County and two in Newton County. Most known caves on the OSFNFs have been surveyed for bats or evaluated for the potential for Indiana bat hibernation habitat. The OSFNFs placed cave gates on five known Indiana bat hibernacula to reduce the threat of human disturbance to the bats, with cave gates prioritized at caves with the highest historical counts and the most consistent winter use by Indiana bats.

Spring Staging (March 1 to April 30)

Radio tracking of Indiana bats at caves on the OSFNFs have identified multiple spring staging and transitional roost trees. On the Big Piney Ranger District, the OSFNFs found that bats stage anywhere from a single night or multiple nights for foraging. Spring roost tree preference is similar to the fall swarming and summer roosting exhibited by Indiana bats on the OSFNFs. The bats tended to utilize pine snags or shagbark hickory trees, but white oaks have also provided roosts. After a brief period of foraging, and once weather conditions are favorable, reproducing females migrate to their maternity colonies.

Summer Roosting (May 1 to August 14)

Recent work (2017 to present) has been conducted to improve our understanding of the summer ecology of female Indiana bats that hibernate in caves in the Ozark Plateau in Arkansas. Female bats have been tracked from hibernacula, both from caves on Forest and from caves near the Forest, to better understand the migration patterns and to find the summer maternity colony sites.

Females have been found to use temporary roost trees for one or more nights on their migration across the OSFNFs, but no maternity colonies have been found in the vicinity of the OSFNFs. Female bats have been tracked migrating north into Missouri, south, with the longest distance migrant last located south of the Arkansas River, and west to bottomland hardwood forests in the Black River area, where a maternity colony has been documented. Prior to this study, only one female bat had been captured on the OSFNFs during the summer. The captured female was a post-lactating individual captured in July on the Big Piney Ranger District in the headwaters of the Buffalo River, and she is believed to have been on a return migration. Additional efforts are planned to further clarify the migratory patterns of this population, with the hope of locating additional maternity sites.

Between 2006 and 2019, the OSFNF conducted mist net surveys at 1,540 sites, with some sites netted for multiple nights, for a total of 2,335 nights of netting (Table 2 and Figure 2). These surveys resulted in the capture of 25 Indiana bats. Due to the different behavioral patterns between males and females, all but one of those captured on the forest were male. Summer mist-netting surveys have primarily focused on Indiana bat conservation zones, or areas within five miles of known hibernacula. However, the OSFNF has completed numerous surveys outside of the Indiana bat conservation zones to determine if Indiana bats are present in other parts of the OSFNFs; to date, only one Indiana bats have been identified outside of these zones during the summer mist-net surveys.

Table 2. Number of Bat Mist-net Survey Sites Conducted on the OSFNFs, 2006 to 2019

Ranger District	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Big Piney			28	155	63	87	19	27	11	9	20	24	2	14	459
Boston Mt	16		23	23	27	41	38	36	33	7	35	29	29	27	364
Mt. Magazine			8		4	4	4	9	12		8	13			62
Pleasant Hill			7		29	2	6	10	17	7	5	15	2	9	109
St. Francis NF								5	11		3				19
Sylamore			21	32	40	17	49	55	52	36	61	53	70	41	527
Total	16	0	87	210	163	151	116	142	136	59	132	134	103	91	1,540

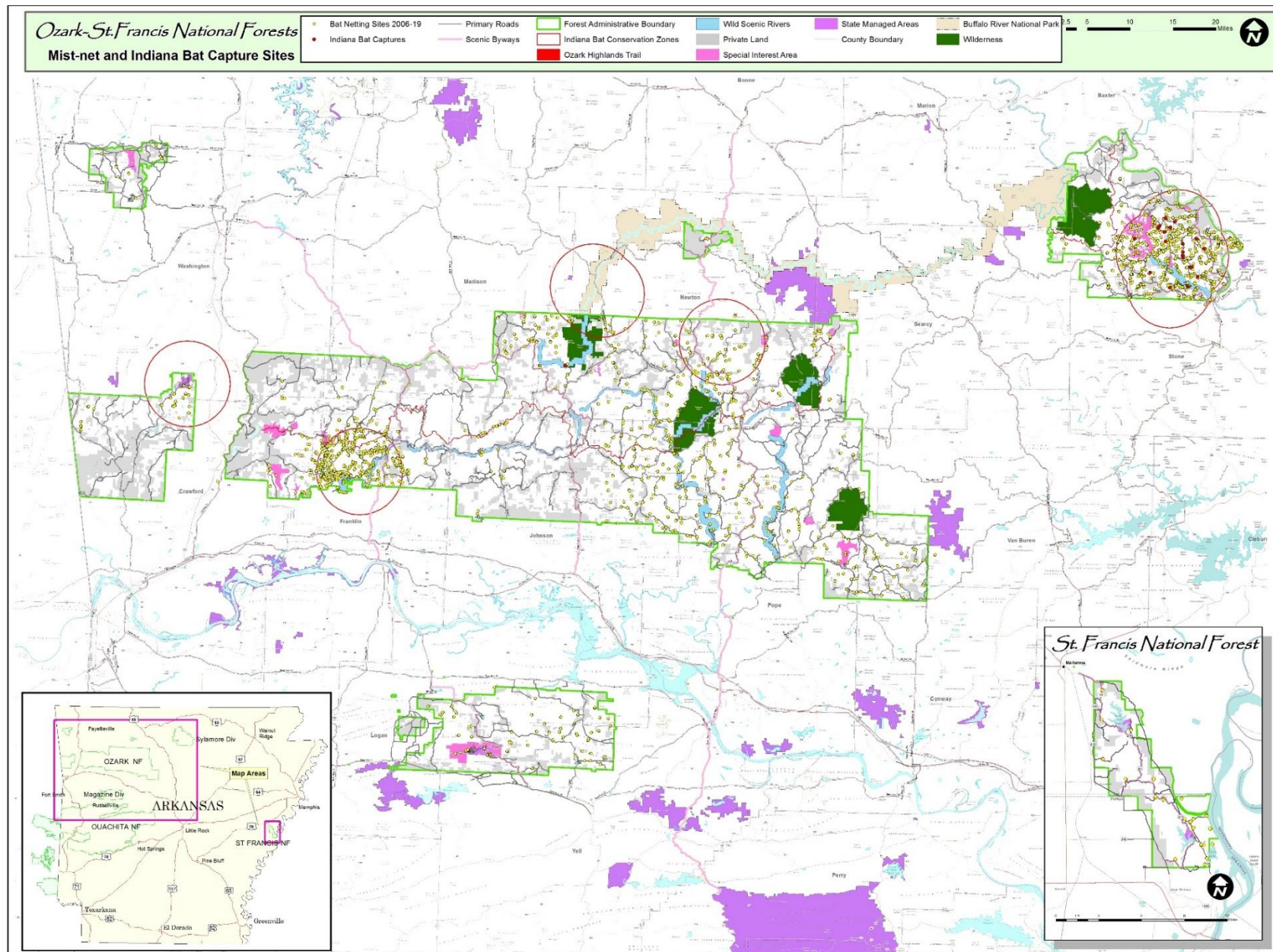


Figure 2. Bat Mist-Net Survey Sites, 2006 to 2019

Many of the males captured on the OSFNFs since 2013 have been tracked with radio telemetry to roost trees. Most commonly, these bats have been found to roost in pine snags, but they have also been found to roost in oak and hickory snags and live pine trees. In studies across the species range, the Indiana bat has been found to roost in trees larger than the surrounding area in moderate to large canopy gaps (Silvis *et. al.*, 2016). That pattern seems to generally hold true with the limited number of male bats captured on the OSFNFs during the summer, as they have been found to frequently use roost trees in forest stands with recent thinning and prescribed fire activities. Most of the roost trees used on the OSFNFs have been snags that are in advanced decay stages. A recent status review of the known Indiana bat roost trees on the OSFNFs indicates the ephemeral nature of the roosts (Table 3). Of the 13 known roost trees, eight had fallen over due to natural causes and decay.

Table 3. Indiana Bat Roost Tree Status on the OSFNFs in 2019

Roost Status in 2019	Year Bat Roosting Detected						
	2013	2014	2015	2016	2017	2018	2019
Standing*			1		1	2	1
Down	2	2	2	1	1		

*All of the trees were standing dead snags during the detected roosting events except for one live shortleaf pine in 2018.

Gray Bat – (*Myotis grisescens*) – Endangered

The gray bat uses cave habitats for roosting both during the hibernation period and during the active season and will rarely use other habitats for roosting. This species has very specific cave requirements; as a result, less than five percent of available caves are utilized. During transitional periods, gray bats may use transient caves that have a broader range of conditions than summer and winter caves. In addition, males and yearling females will use a wider variety of caves and roost sites throughout the year than reproductive females.

Summer caves are typically located within one mile, rarely over two miles, from rivers and reservoirs over which they forage. Gray bats specialize on foraging on emergent aquatic insects, although they can be opportunistic and will forage in upland areas. Because gray bats roost in caves, individual forest management actions typically do not affect gray bats, as long as water quality and riparian conditions are protected to promote aquatic invertebrate populations.

Although gray bats have been found with symptoms of white-nose syndrome, the disease has not had negative population-level effects on the species. In fact, since white-nose syndrome has spread through the eastern U.S., populations of gray bats have been increasing, likely in part related to effective protection of caves.

Ozark Big-eared Bat (*Corinorhynchus townsendii ingens*) – Endangered

This species historically occurred in northeastern Oklahoma, northwestern Arkansas and southwestern Missouri. The total population is believed to be comprised of less than 2,000 individuals, with the majority in Oklahoma. The Ozark big-eared bat is believed to be extirpated from Missouri. This species has been reported in Crawford, Marion, Franklin, and Washington counties in Arkansas. This species inhabits caves in forested areas dominated by mature hardwood forests and utilizes caves year-round as roost. The temperature of hibernation caves ranges from 40° to 50°F (4-9°C). Maternity colonies are located in caves that range in temperature between 50° and 59°F (10-15°C). Ozark big-eared bats forage along forest edges on moths. The primary threat is believed to be disturbance and vandalism of their cave habitats.

Northern long-eared bat – (*Myotis septentrionalis*) – Threatened

The northern long-eared bat (NLEB) is a small to medium sized bat with a body length of three-four inches and a wingspan of nine-ten inches; however, this bat can be distinguished by longer ears as compared to other *Myotis* species. The NLEB is distributed across the eastern and north central U.S. and into Canada.

NLEB arrive at the hibernacula in August or September, begin hibernation in October and November, and leave the hibernacula in March or April. During the winter, the bats will hibernate in caves or mines with large entrances and passages, high humidity, and constant temperatures without drafts. During the summer, this species typically roosts in live or dead trees under bark, in cavities, or in crevices; however, some individuals may roost in caves and mines or, rarely, in structures. Maternity colonies are primarily found in snags or declining live trees in forest openings, and generally, the species has been found to be a forest-dwelling generalist and opportunistic in roost tree species selection (Silvis *et al.*, 2016). NLEB may show a preference for roosting in larger trees than the average available, but they have been known to roost in trees as small as 4 inches dbh. Individual NLEB utilize multiple roost trees during the summer, utilizing a wide variety of tree species for roosts.

NLEB forage in forested habitats including within forested stands, forest edges, over ponds or other water sources, and forest clearings. Their diet may consist of moths, flies, leafhoppers, caddisflies, and beetles which will be caught in flight via echolocation or by gleaning from leaf and water surfaces. In Arkansas, pine snags and mature pine forests with thinned understory likely provide important habitat for NLEB. Hardwood stands with numerous medium to large trees and reduced understory clutter is another valuable habitat.

Threats to this species include alteration and disturbance of caves and mines, structures that restrict access and passage in caves and mines, wind turbines, forest development, and white-nose syndrome. White-nose syndrome is the primary cause of decline for the species. Habitat loss and disturbance related to forest management are not thought to be substantial threats to the species (Silvis *et al.*, 2016).

NLEB is distributed across all forested land on the Ozark National Forest and is absent from the St. Francis National Forest. In the summer mist-netting surveys conducted on the OSFNFs from 2006 to 2015, NLEB was one of the most abundant bats on the Forest landscape. Since 2015, white-nose syndrome has resulted in a precipitous decline in the number of NLEB caught during mist-netting surveys and the species is now rare in the OSFNFs.

Context of Forest Management Effects on Tree-roosting Bats

Although the proposed Forest Plan amendment would not change the overall approach to vegetation and habitat management on the OSFNFs, background on the effects of forest management activities can help provide important context to understand the effects of the proposed programmatic changes to the Forest Plan.

The tree-roosting bats that occur on the OSFNFs include Indiana bat, northern long-eared bat, red bat, silver-haired bat, Seminole bat, hoary bat, evening bat, tri-colored bat, southeastern bat, Rafinesque's big-eared bat, small-footed bat, big brown bat and little brown bat. Forest vegetation management can positively or negatively affect bat habitats at multiple spatial scales and during all facets of bat life history, including foraging habitat, maternity and day roosts, hibernacula and fall swarming, and spring staging habitat. Indiana bat is a tree-roosting bat, for which vegetation management can play a key role in providing and/or enhancing day roost and maternity roosting

habitat. Although there is currently no evidence of maternity roosting by Indiana bats on the OSFNFs, forest management may enhance areas not currently used for maternity colonies by providing networks of suitable roosting trees and foraging habitats. Vegetation management in the vicinity of hibernacula may also be important in enhancing fall swarming and spring staging habitat. Conservation of forest cover and/or management of areas in the vicinity of hibernacula to provide snags can increase suitable roost habitat for tree-roosting bat species during swarming. There are numerous forest-wide standards that ensure the retention of snags, shagbark hickory, and other trees, which allow for Indiana bat roost sites. Managing for retention of snags is required by forest-wide standard 33, which maintains six snags per acre across the OSFNFs and nine snags per acre in the Indiana bat conservation zones. Timber operations typically avoid removal of any snags except for those that pose a safety risk to personnel, such as those located immediately surrounding a log landing.

Bat activity and foraging may be greatly influenced by forest clutter. Studies throughout North America suggest that most bats avoid highly cluttered areas and prefer to forage and travel in areas with less clutter (Erickson and West, 2003; Humes *et al.*, 1999). Bats are often more active in early and late-seral stages which are usually less cluttered than in intermediate forest stages (Erickson and West, 2003; Humes *et al.*, 1999; Loeb and O'Keefe, 2006; Menzel *et al.*, 2005). Thinning may reduce clutter and lead to increased bat activity (Erickson and West, 2003; Lacki *et al.*, 2009a), although some studies suggest no response by bats to thinning (Tibbels and Kurta, 2003). Responses to clutter differ among bat species. Differences in bat size, morphology and the echolocation frequencies used among species are believed to make some species more adapted to foraging in cluttered habitats, whereas others are more adapted to foraging in open habitats (Aldridge and Rautenbach, 1987). Indiana bats may readily utilize cluttered forests (Ford *et al.*, 2005; Schirmacher *et al.*, 2007).

Vegetation management and other habitat manipulation (e.g., the creation of water sources) can also be used to maximize insect (prey) availability for bats during spring emergence; the availability of such food resources in the general vicinity of hibernacula can be important to bats affected by white-nose syndrome as they emerge in spring and attempt to restore body fat and repair tissue damage from white-nose syndrome infection. In addition, within a forested landscape, vegetation management can provide edge habitat that is frequently used by bats for commuting and foraging, and can strongly influence both short- and long-term prey availability in a given area.

Potential Effects of Fire on Forest Bats

Overall, fire may result in both the loss and the production of snags. Fire could have mixed effects on Indiana bat habitat. Fire could burn a suitable roost tree or weaken it to such an extent that it would fall shortly after. Also, a fire could burn off bark peeling from a roost, taking away preferred roosting locations on the tree. On the other hand, fire could kill some trees, creating new roosting habitat. Research has found that bats often take advantage of fire-killed snags (Perry, 2012). Fire in any season that results in tree mortality may provide more benefit to Indiana bat through snag creation than any negative impacts that may occur. In the long term, fire may benefit Indiana bat habitat by reducing the threat of future severe fires. Aside from creating snags, periodic prescribed burning may reduce the number of woody shrubs, understory trees, and midstory trees (10-25 cm d) in the short term (Blake and Schuette, 2000; Hutchinson *et al.*, 2005). Longer-term applications of prescribed fire may reduce stand density (Hutchinson *et al.*, 2005; Peterson and Reich, 2001) and complexity (clutter). Repeated low-intensity fire reduces clutter in the midstory and understory and creates more open forests, which may provide more favorable roosting and foraging conditions for many bat species, especially females during the reproductive season. Canopy gaps created by fire may provide favorable roosting sites with greater solar

exposure during summer for maternity colonies (Johnson *et al.*, 2010). Furthermore, maternity roosts may be located in areas with few midstory trees or relatively lower tree densities, which may provide both greater solar exposure and more open areas immediately around and below roosts that would otherwise impede inexperienced juvenile flyers (Perry and Thill, 2007). Thus, burned areas may have lower tree densities, less structural clutter, more open canopy, and greater numbers of snags, which may provide favorable roosting areas for many species.

Indiana bats would likely not be harmed during a fire because they could fly away to avoid smoke and flames. If there are unknown maternity colonies on the landscape, there is a possibility of direct mortality of non-volant young (young that are unable to fly), unless the mothers are able to carry their pups away from the fire. Any discovered maternity colonies would be protected under this plan amendment.

Looking at several studies, Dickinson and others (2009) examined bat responses to fire. Prescribed fires cause roost-switching behavior in tree-roosting bats that would reduce their exposure to smoke. Reproductive females are generally expected to maintain high body temperatures and, thus, be able to respond quickly to fires. However, use of torpor (lowering metabolism functions to reduce energy consumption) by pregnant female bats during spring storms has been demonstrated. Extensive use of torpor by roosting males and non-reproductive females would increase their risk of smoke exposure, though use of torpor and arousal times under typical burning conditions are unknown.

Winter prescribed fire could affect bats that roost on or near the ground level. Silver-haired bats winter roosting in the Ouachita Mountains roosted in trees 90% of the time, in rock outcrops 3% of the time and at ground level 6% of the time (Perry *et al.*, 2010). Bat roosting in trees, rock outcrops, or underground would be expected to have low risk to exposure to lethal direct effects from prescribed fire. Silver-haired bats occupy the southern US "south of a line from Pennsylvania to Missouri to southern Arizona and California" (Perry *et al.*, 2010). Based on their broad winter distribution and their tendency to roost in trees or rock outcrops, the risk from prescribed fire to this species population would be low. Red bats have been found to roost in litter during cold periods in the winter. A number of researchers have considered the potential effects of winter season prescribed fire on red bats. Red bats have been observed emerging from leaf litter during prescribed burns on the Ozark-St. Francis National Forests. Layne (2009) found that arousal from torpor and flight response of red bats in the vicinity of fires was negatively correlated with temperature. Perry and McDaniels (2015) found that during prescribed burns, temperatures below leaf litter commonly exceeded lethal temperatures for litter-roosting bats, but they also showed that on sunny, south-facing slopes that temperatures would warm considerably during the day, which would reduce the time needed for arousal for bats in torpor, increasing the chance of bats escaping direct effects from fires during the warmer parts of the day (Perry and McDaniel, 2015). Although the risks to red bats from fire have been addressed, there are no documented mortality of the species from prescribed fire (Perry personal communication, 2020). Mist-netting on the OSFNFs from 2006 to 2019, normalized for number of nets, did not indicate a trend in red bat numbers ($r^2 = 0.007$, $p = 0.8$). Regarding the winter distribution of red bats, Cryan (2003) writes, "during winter, (red bat) occurs throughout the southeastern United States and northeastern Mexico, but concentrations are highest in coastal Atlantic and Gulf of Mexico regions." There is also evidence that females are more likely to move farther south than males. Based on both the site-specific information and the species distribution, there existing information suggests that prescribed fire on the OSFNFs does not pose a substantial risk to red bats or silver-haired bat populations.

Effects of Road/ Trail Construction, Reconstruction and Maintenance

The effects of road and trail construction and management would be similar to those discussed under Forest Management. Road and trail work can involve the removal of trees. Most frequently, the trees are along existing open corridors, so the effects on the structural condition of these sites would be minimal. In rare circumstances, new roads or trails constructed would open new corridors. Bats are known to forage along corridors in the Forest and would experience foraging benefits from new road and trail construction and maintenance. In the short term, the management actions could result in lost roost trees, or disturbance from construction equipment noise.

Effects of Tree Removal Other Than Timber Harvest

The effects to Indiana bat from non-timber related tree removal activities are very similar to the effects of timber management; the primary difference is that many non-timber tree removal areas are maintained as open areas in perpetuity. As with timber activities, the action can result in removal of roost trees and generates the risk of falling a tree with bats in the tree or causing flushing while creating disturbing activities around a roost. Creation of small openings or corridors, such as rights-of-way, roads, and trails can promote plant diversity and support increased invertebrate abundance and provide edge habitat with favorable foraging conditions. Some of the linear features can also provide foraging corridors through otherwise cluttered forest conditions. Construction and maintenance of ponds can improve habitat availability, as water sources can be a limiting factor in distribution. Ponds also provide valuable foraging opportunities as these small ponds can produce substantial aquatic invertebrates. Some tree removal may reduce foraging availability, such as gas pad clearing that completely removes vegetation. Other efforts to remove trees may result in the loss of roosting structures or alterations in foraging habitat, but in the context of the largely contiguous forest condition, these projects would not add substantially to fragmentation.

Effect to Species

The Indiana bat is the species that would be most affected by the proposed plan amendment. Because the amendment would remove the requirement for site-specific surveys prior to tree cutting or prescribed fire during the active season in the Indiana bat conservation zones, there is an increased risk that individuals or small groups of bats would be located in a tree that was cut. However, there are a number of factors that make it unlikely or very rare that a tree would be cut with a roosting Indiana bat. Tree cutting occurs on only approximately 1% of the OSFNFs land base in a given year. Of that tree removal, the cutting that occurs in the winter months, when Indiana bats are hibernating in caves, would not directly affect bats. Sampling efforts demonstrate that Indiana bats are very rare outside of the Indiana bat conservation zones during the summer roosting season, May 1 to August 14, which covers 11.7% of the OSFNFs managed lands. Furthermore, Indiana bats typically roost in snags, most of which are retained even within a harvest unit. In addition, the proposal would add acres that would be protected from cutting during the spring emergence and fall swarming period, when Indiana bat densities are highest. With all of these factors, the likelihood of cutting a tree with roosting bats is low, but not discountable. Removing the clearance surveys would add to the risk of cutting when an Indiana bat is present, but that risk would be offset by the additional protections added during fall swarming and spring emergence. Prescribed fire is conducted on 5-7% of the OSFNF in a typical year, so there is a chance that an Indiana bat would be roosting in a prescribed burn area. Because of bats' typical roosting height (about 30 feet per Lacki *et al.*, 2009b) and the likelihood that bats would fly away from the fire, this makes the risk of injury or mortality from smoke or heat discountable. More likely, prescribed fire would trigger daytime flight response, which may

increase predation risk. This risk is mitigated because most of the prescribed fire occurs during the hibernation season.

In addition, Indiana bats would benefit from permanent protections for known roost trees outside of the Indiana bat conservation zones, added protections around maternity roosts, where they are discovered, and retention of reserve trees within regeneration stands to provide long-term roost supplies within the Indiana bat conservation zones. Overall, the proposal would benefit the Indiana bat population, but it would increase the risk of individual injury or mortality in certain circumstances.

The proposed changes to forest-wide standard 71 would benefit gray bats, Ozark big-eared bats and other bats that use the hibernacula by increasing the protection around those important habitats. This projection would help maintain the cave microclimates, reduce human disturbance of the sites, and maintain natural foraging conditions in the immediate vicinity of the roosts.

Northern long-eared bats would benefit from the additional protections associated with known female roost trees. Females may repeatedly roost in trees or snags, and this protection would maintain those structures for raising pups.

Effects - Cumulative

Because the effects of the amendment are limited to the bat species specifically included in the changes to Forest Plan elements, the only potential for cumulative effects would also be related to those species. Since the proposed amendment would not change the type or amount of management that would occur under the Forest Plan, and would only change conservation practices related to bats, there would be no consequential effects to other wildlife species, so there would be no cumulative effects to those species. For Ozark big-eared bats, northern long-eared bats, and gray bats, the proposed changes only have neutral or beneficial effects for populations, so there would be no cumulative effects for those species. The effects to those species from implementation of the Forest Plan would not change. For Indiana bats, some restrictions are reduced and others are added, but the proposal should be neutral or beneficial to the Indiana bat population. Because this programmatic amendment would not change the types or amount of activities implemented under the Forest Plan, there would be no significant cumulative effects.

Regional Forester's Sensitive Species and Conservation Species

Effects – Proposed Action

Because the proposed action does not change the scale, intensity, or locations of management under the Forest Plan with the exception of added protections that restrict activities around some caves and modifying the timing of activities in limited areas of the landscape, there would be no substantial impacts to any of the Regional Forester's Sensitive Species (Table A-1). In some cases, tri-colored and small-footed bats are found to use the same caves as Indiana, gray or Ozark big-eared bats. These sensitive species would benefit from the additional habitat protections around caves. However, this would not have consequential population-level benefits because of the limited habitat overlap. Southeastern bats and Rafinesque's big-eared bat would not be affected by the proposed changes. The proposal would not impact any other Regional Forester's Sensitive Species.

Terrestrial Species

Because the proposed action does not change the scale, intensity, or locations of management under the Forest Plan with the exception of added protections that restrict activities around some caves and modifying the timing of activities in limited areas of the landscape, there would be no

substantial impacts to any of the terrestrial species across the OSFNFs, including both game and non-game species. The change in project timing on such a small portion of the OSFNFs would not have population-level effects to terrestrial species, including both game and non-game species.

Aquatic Species

The proposal would have very limited effects on aquatic species in streams, lakes, or ponds on the OSFNFs because the proposal would not change the types of management conducted within these areas. The proposal could lead to minor changes in activity timing within the Indiana bat conservation zones, but those changes would have very minor consequences for aquatic populations as a result of implementing all appropriate Best Management Practices to minimize sedimentation.

Addressing 36 CFR 219 Planning Rule Requirements

The 2012 Planning Rule requires notification on which of the substantive rule requirements for sustainability, plant and animal diversity, multiple uses, and timber (36 CFR 219.8-219.11) are likely to be directly related to the plan direction being changed by the proposed plan amendment. A specific substantive requirement is determined to be “directly related” based on the purpose of the amendment, if the NEPA documentation reveals substantial adverse effects associated with the requirement, or if the amendment would substantially lessen protections for a specific resource or use.

The public was notified during scoping in April 2019 that for this plan amendment, the planning rule requirements relating to the diversity of plant and animal communities (36 CFR 219.9) are the rule requirements that are likely to be directly related to the plan direction being changed. Since the purpose of this plan amendment is to address the changes in the science applicable to the management of bat habitat, include provisions for maternity colonies, and address seasonal protective standards for bat habitats, it has been determined that the planning rule requirements found in 36 CFR 219.9(a) and (b) are “directly related” to this amendment. Therefore, within the scope and scale of this amendment, these requirements will need to be addressed.

The proposed action identifies the plan components that are either being changed or added to address the purpose and need of this amendment, and to also address any potentially adverse impacts identified through both internal and external scoping. The previous sections of this EA document how the proposed changes and additions to plan components will address possible effects to at-risk species. Appendix A documents the summary of “findings” or “determinations” of how the amendment will affect the various at-risk species.

In summary, both terrestrial and aquatic species will have a beneficial effect from proposed changes and habitat across the landscape would be generally improved for wildlife species. There may be short-term changes to bat species habitat availability; however given the extent of available habitat across the OSFNFs, coupled with balancing age classes, the ecological conditions necessary to contribute to the recovery of the threatened and endangered bat species are still being provided. The amended plan components would also provide the habitat needed for the conservation of the proposed and candidate species, and would provide the habitat needed to maintain a viable population of the remaining species of concern.

References

- Abrams, M.D. 1992. Fire and the development of oak forests. *Bioscience*. 42: 346-353.
- Aldridge, H.D.J.N., and I.L. Rautenbach. 1987. Morphology, echolocation, and resource partitioning in insectivorous bats. *Journal of Animal Ecology*. 56: 763-778.
- Arkansas Department of Agriculture. 2002. Best Management Practices for Water Quality Protection. Forestry Division, Little Rock, AR 72204. 56 pp. Available at: <https://www.agriculture.arkansas.gov/best-management-practices-water-quality>
- Blake, J.G., and B. Schuette. 2000. Restoration of an oak forest in east-central Missouri: early effects of prescribed burning on woody vegetation. *Forest Ecology and Management*. 139: 109-126.
- Brooks, R.T. 2009. Habitat-associated and temporal patterns of bat activity in a diverse forest landscape of southern New England, USA. *Biodiversity and Conservation*. 18:529–545.
- Boyles, J.G., and D.P. Aubrey. 2006. Managing forests with prescribed fire: implications for a cavity dwelling bat species. *Forest Ecology and Management*. 222: 108-115.
- Brose, P., and D. Van Lear, D. 1999. Effects of seasonal prescribed fires on residual overstory trees in oak-dominated shelterwood stands. *Southern Journal of Applied Forestry*. 23: 88-93.
- Carter, T.C., W.M. Ford, and M.A. Menzel. 2002. Fire and bats in the southeast and mid-Atlantic: more questions than answers. In: Ford, W.M., K.R. Russell, and C.E. Moormann, eds. *The role of fire in nongame wildlife management and community restoration: traditional uses and new directions*. Gen. Tech. Rep. NE-288. Newton Square, PA: U.S. Department of Agriculture, Forest Service. Northeastern Research Station: 139-143.
- Caviness, M. 2003. Effects of prescribed fire on cave environment and bat inhabitants. *Bat Research News*. 44:130.
- Dickinson, M.B., M.J. Lacki, and D.R. Cox. 2009. Fire and the endangered Indiana bat. In: Hutchinson, Todd F., ed. *Proceedings of the 3rd fire in eastern oak forests conference; 2008 May 20-22; Carbondale, IL*. Gen. Tech. Rep. NRS-P-46. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 51-75.
- Dodd, L.E., M.J. Lacki, E.R. Britzke, D.A. Buehler, P.D. Keyser, J.L. Larkin, A.D. Rodewald, T.B. Wigley, P.B. Wood and L.K. Rieske. 2012. Forest structure affects trophic linkages: How silvicultural disturbance impacts bats and their insect prey. *Forest Ecology and Management*. 267: 262–270.
- Dugan, A., D. McKinley, and A. Burt. 2019. Forest Carbon Assessment for the Ozark-St. Francis National Forests in the Forest Service's Southern Region. U.S. Department of Agriculture, Forest Service, Southern Region. 24 p.
- Erickson, J.L., and S.D. West. 2003. Associations of bats with local structure and landscape features of forested stands in western Oregon and Washington. *Biological Conservation*. 109:95-102.

- Ford, W.M., M.A. Menzel, J.L. Rodrigue, J.M. Menzel, and J.B. Johnson. 2005. Relating bat species presence to simple habitat measures in a central Appalachian forest. *Biological Conservation*. 126: 528-539.
- Hammond, P. C., and J.C. Miller. 1998. Comparison of the biodiversity of Lepidoptera within three forested ecosystems. *Annals of the Entomological Society of America*. 91(3): 323-328.
- Humes, M. L., Hayes, J. P., & Collopy, M. W. (1999). Bat activity in thinned, unthinned, and old-growth forests in western Oregon. *The Journal of Wildlife Management*. 553-561.
- Hutchinson, T.F., E.K. Sutherland, and D.A. Yaussy. 2005. Effects of repeated prescribed fires on the structure, composition, and regeneration of mixed-oak forests in Ohio. *Forest Ecology and Management*. 218: 210-228.
- Johnson, J.B., W. M. Ford, J.L. Rodrigue, J.W. Edwards, and C.M. Johnson. 2010. Roost selection by male Indiana *Myotis* following forest fires in Central Appalachian hardwoods forests. *Journal of Fish and Wildlife Management*: November 2010, Vol. 1, No. 2, pp. 111-121.
- King, R. 2019. Indiana Bat (*Myotis soldalis*) 5-Year Review: Summary and Evaluation.
- Lacki, M.J., D.R. Cox, L.E. Dodd, and M.B. Dickinson. 2009a. Response of northern bats (*Myotis septentrionalis*) to prescribed fires in eastern Kentucky forests. *Journal of Mammalogy*. 90:1165-1175.
- Lacki, M. J., D.R. Cox, and M.B. Dickinson. 2009b. Meta-analysis of summer roosting characteristics of two species of *Myotis* bats. *The American Midland Naturalist*. 162(2), 318-326.
- Loeb, S.C. and J.M. O’Keefe. 2006. Habitat use by forest bats in South Carolina in relation to local, stand, and landscape characteristics. *Journal of Wildlife Management*. 70:1210–1218.
- Menzel, J.M., W.M. Ford, M.A. Menzel, T.C. Carter, J.E. Gardner, J.D. Gardner, and J.E. Hofmann. 2005. Summer habitat use and home-range analysis of the endangered Indiana bat. *Journal of Wildlife Management*. 69(1):430-436.
- Morrison, M.L., and M.G. Raphael. 1993. Modeling the dynamics of snags. *Ecological Applications*. 3: 322-330.
- Nowacki, G.J., and M.D. Abrams. 2008. The demise of fire and “mesophication” of forests in the eastern United States. *Bioscience*. 58: 123-138.
- O’Keefe, J.M. 2009. Roosting and foraging ecology of forest bats in the Southern Appalachian Mountains. PhD Dissertation. Clemson University, Clemson, SC.
- Perry, R. W., S.C. Brandebura, and T.S. Risch. 2016. Selection of tree roosts by male Indiana bats during the autumn swarm in the Ozark Highlands, USA. *Wildlife Society Bulletin*. 40(1): 78-87.
- Perry, R.W. and R.E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. *Forest Ecology and Management*. 247:220-226.
- Perry, R. W., R.E. Thill, and D.M. Leslie Jr. 2008. Scale- dependent effects of landscape structure and composition on diurnal roost selection by forest bats. *The Journal of Wildlife Management*. 72(4): 913-925.

- Perry, R. 2012. A review of fire effects on bats and bat habitat in the eastern oak region. Proceedings of the 4th Fire in Eastern Oak Forests Conference. GTR-NRS-P-102.
- Perry, R. 2020. Personal communication on 6/3/2020.
- Peterson, D.W., and P.B. Reich. 2001. Prescribed fire in oak savanna: fire frequency effects on stand structure and dynamics. *Ecological Applications*. 11: 914-927.
- Rudolph, D.C., C.A. Ely, R.R. Schaefer, J.H. Williamson, and R.E. Thill. 2006. Monarch (*Danaus plexippus* L. *nymphalidae*) migration, nectar resources and fire regimes in the Ouachita Mountains of Arkansas. *Journal of the Lepidopterists' Society*. 60: 165-170.
- Roby, P. L., M.W. Gumbert, and M.J. Lacki. 2019. Nine years of Indiana bat (*Myotis sodalis*) spring migration behavior. *Journal of Mammalogy* advance article. DOI, 10.
- Schirmacher, M.R., S.B. Castleberry, W.M. Ford, and K.V. Miller. 2007. Habitat associations of bats in south-central West Virginia. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies. 61: 46-52.
- Silvis, A., R. Perry, and W.M. Ford. 2016. Relationships of three species of bats impacted by white-nose syndrome to forest condition and management. Gen. Tech. Rep. SRS-214. Asheville, NC: US Department of Agriculture Forest Service, Southern Research Station, 214, 1-48.
- Summerville, K.S. and T.O. Crist. 2002. Effects of timber harvest on forest lepidoptera: community, guild, and species responses. *Ecological Applications* 12:820-835.
- Smith, K.T., and E.K. Sutherland. 2006. Resistance of eastern oak hardwood stems to fire injury and damage. In: Dickinson, M.B., ed. Fire in eastern oak forests: delivering science to land managers, proceedings of a conference. 2005 November 15-17; Columbus, OH. Gen. Tech. Rep. NRSP-1. Newton Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 201-217.
- Summerville, K.S. and T.O. Crist. 2002. Effects of timber harvest on forest lepidoptera: community, guild, and species responses. *Ecological Applications*. 12:820-835.
- Thill, R.E., D.C. Rudolph, and N.E. Koerth. 2004. Shortleaf pine-bluestem restoration for red-cockaded woodpeckers in the Ouachita Mountains: implications for other taxa. In: Costa, R., and S.J. Daniels, eds. Red-cockaded woodpecker: road to recovery. Blaine, WA: Hancock House Publishers: 657-671.
- Tibbels, A.E., and A. Kurta. 2003. Bat activity is low in thinned and unthinned stands of red pine. *Canadian Journal of Forest Research*. 33: 2436-2442.
- Titchenell, M.A., R.A. Williams, and S.D. Gehrt. 2011. Bat response to shelterwood harvests and forest structure in oak-hickory forests. *Forest Ecology and Management*. 262:980-988.
- Timpone, J. C., J.G. Boyles, K.L. Murray, D.P. Aubrey, and L.W. Robbins. 2010. Overlap in roosting habits of Indiana bats (*Myotis sodalis*) and northern bats (*Myotis septentrionalis*). *The American Midland Naturalist*. 163(1): 115-124.
- USDA Forest Service, 2005a. Final Environmental Impact Statement, Ozark-St. Francis National Forest. Record of Decision, Ozark-St. Francis National Forests. Russellville, Arkansas.

USDA Forest Service, 2005b. Revised Land and Resource Management Plan (Forest Plan), Ozark-St. Francis National Forest. Ozark-St. Francis National Forests. Russellville, Arkansas.

USDA Forest Service, 2005c. Biological Assessment for the Ozark-St. Francis National Forests Land and Resource Management Plan. Ozark-St. Francis National Forests. Russellville, Arkansas.

US Fish and Wildlife Service (USFWS). 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. Great Lakes-Big Rivers Region - Region 3 Fort Snelling, Minnesota.

Van Lear, D.H., and R.F. Harlow. 2002. Fire in the eastern United States: influence on wildlife habitat. In: Ford, W.M., K.R. Russell, and C.E. Moorman., eds. The role of fire in nongame wildlife management and community restoration: traditional uses and new directions. Gen. Tech. Rep. NE-288. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 2-10.

APPENDIX A

Summary of Effects Determinations for Threatened, Endangered, and Regional Forester's Sensitive Species Related to the Proposed Plan Amendment

Table A-1. Comparison of Effects of Forest Plan Implementation on ESA-listed species based on Current Forest Plan Language (No Action Alternative) and Amended (Proposed Action)

Species	Status	OSFNF Presence	Effects (Current Plan)	Effects (Plan Amendment)	Comments
Gray bat (<i>Myotis grisescens</i>)	E	1	NLAA	NLAA	Known occurrences across OSFNF.
Indiana bat (<i>Myotis sodalis</i>)	E	1	NLAA	LAA	Known occurrences across OSFNF.
Ozark big-eared bat (<i>Corynorhinus townsendii ingens</i>)	E	1	NLAA	NLAA	Talus and karst features in the BMRD. Reported in the PHRD, but not reported in the Magazine RD.
Northern long-eared bat (<i>Myotis septentrionalis</i>)	T	1	LAA	LAA	Widespread across OSFNF.
Piping plover (<i>Charadrius melodus</i>)	T	2	NE	NE	Incidental habitat use in OSFNF. Possible migration visitors on lake shores and/or riverbanks.
Hell Creek cave crayfish (<i>Cambarus zophonastes</i>)	E	2	NE	NE	Cave streams in Benton County, Arkansas.
Cave crayfish (<i>Cambarus aculabrum</i>)	E	2	NE	NE	Only occurs in Northwest Arkansas.
Ozark cavefish (<i>Troglichthys rosae</i>)	T	2	NE	NE	Only occurs in Northwest Arkansas.
Ozark hellbender (<i>Cryptobranchus alleganiensis bishopi</i>)	E	2	NE	NE	Restricted to southern Missouri and northeastern Arkansas.
Pallid sturgeon (<i>Scaphirhynchus albus</i>)	E	1	NE	NE	Known from the St. Francis and Mississippi Rivers.
Yellow-cheek darter (<i>Etheostoma moorei</i>)	E; CH	2; 3	NE	NE	Endemic to the Little Red River. Found downstream of BPRD in the South Fork of the Little Red in Van Buren County. Critical habitat is outside OSFNF boundary.
American alligator (<i>Alligator mississippiensis</i>)	T	1	NE	NE	Found in St. Francis NF.
American burying beetle (<i>Nicrophorus americanus</i>)	E	1	LAA	LAA	Occurs on western edge of MMRD. No element of occurrence records elsewhere on the OSFNF and not likely to occur. Years of survey efforts and historical data.
Ivory-billed woodpecker (<i>Campephilus principalis</i>)	E	3	NE	NE	Not reported on the OSFNF.
Interior least tern (<i>Sterna antillarum</i>)	E	1	NE	NE	Found on St. Francis NF.
Missouri bladderpod (<i>Lesquerella filiformis</i>)	T	2	NE	NE	Not reported on the OSFNF.
Pondberry (<i>Lindera melissifolia</i>)	E	2	NE	NE	Not reported on the OSFNF.
Geocarpon (<i>Geocarpon minimum</i>)	T	3	NE	NE	Known from only four southern Arkansas counties. Not reported in the OSFNF. Found in saline soil prairies on natric or saline soils.
Harperella (<i>Ptilimnium nodosum</i>)	E	3	NE	NE	Not reported on the OSFNF.
Pink mucket mussel (<i>Lampsilis abrupta</i>)	E	3	NE	NE	Not reported on the OSFNF.
Scaleshell mussel (<i>Leptodea leptodon</i>)	E	2	NE	NE	Not reported on the OSFNF but downstream in the Frog Bayou (headwaters in BMRD). Widely disjunct occurrences across Arkansas.

Species	Status	OSFNF Presence	Effects (Current Plan)	Effects (Plan Amendment)	Comments
Fat pocketbook mussel (<i>Potamilus capax</i>)	T	1	NE	NE	Not reported on the Ozark NF, but there are records for the St. Francis NF.
Snuffbox mussel (<i>Epioblasma triquetra</i>)	E	2	NLAA	NLAA	Arkansas counties include Benton, Madison, Searcy, Van Buren, Stone, and Baxter.
Speckled pocketbook mussel (<i>Lampsilis streckeri</i>)	E	2	NE	NE	South Fork of the Little Red River. Species not reported on OSFNF lands but occurs in the watershed downstream of the BPRD.
Spectaclecase mussel (<i>Cumberlandia monodonta</i>)	E	1	NLAA	NLAA	Possible presence in Mulberry River Watershed in the PHRD and BMRD.
Neosho mucket mussel (<i>Lampsilis rafinesqueana</i>)	E; CH	1; 1	NLAA	NLAA	Illinois River as it runs through the Wedington Unit of the BMRD.
Rabbitsfoot mussel (<i>Quadrula 3ylindrical 3ylindrical</i>)	T; CH	2; 3	NLAA	NLAA	Range includes Benton, Washington, Crawford, Franklin, Madison, Newton Pope, Searcy, and Van Buren Counties and the Buffalo River in Marion, Newton, and Searcy counties. Critical habitat: Creek confluence southeast of Erbie, downstream to U.S. Highway 65 west of Gilbert.

Notes: BMRD = Boston Mountain Ranger District; BPRD = Big Piney Ranger District; MMRD = Magazine Mountain Ranger District; PHRD = Pleasant Hill Ranger District; NF = National Forest; OSFNFs = Ozark–St. Francis National Forests; RFSS = Regional Forester's sensitive species.

NatureServe Global Conservation Status Ranks: G1 = Critically Imperiled – At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors; G2 = Imperiled – At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure – Common; widespread and abundant; G#G# = Range rank – A numeric range rank is used to indicate the range of uncertainty in the status of a species or community, a G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank.

Rank Qualifiers: Q = Questionable Taxonomy – Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority; ? = Inexact Numeric Rank – Denotes some uncertainty about the numeric rank (e.g. G3? – Believed most likely a G3, but some chance of either a G2 or G4); T# = Intraspecific Taxon (trinomial) – The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the global rank. Rules for assigning T-ranks follow the same principles for global conservation status ranks.

OSFNF Presence Codes: 1 = Species is known to occur in the OSFNF; 2 = Species is not known to occur on OSFNF managed lands, but has suitable habitat within OSFNF and a known distribution which makes occurrence possible; 3 = Species does not occur on OSFNF managed lands and is not likely to occur there due to habitat requirements or geographic distribution.

Effects Determinations: NE = No Affect; NLAA = May effect, but not likely to adversely affect; LAA = May effect, and likely to adversely affect.

Table A-2. Impacts of Forest Plan implementation on Regional Forester's Sensitive Species

Species	Status	OSFNF Presence	Impact Finding	Comments
Eastern small-footed bat (<i>Myotis leibii</i>)	G3	1	BI	Hibernates in caves or mines. Forages near riparian areas and water sources, canopy openings, and near field edges. Newton, Searcy, Stone, Pope, Johnson and Franklin Counties.
Southeastern myotis (<i>Myotis austroriparius</i>)	G4	1	NE	Ouachita NF. Caves and bottomland hardwoods. Occasional transients close to Ozark NF main division. BMRD.
Tri-colored bat (<i>Perimyotis subflavus</i>)	G2G3	1	BI	Forage in forested landscapes near riparian and open habitats.
Rafinesque's big-eared bat (<i>Corynorhinus rafinesquii</i>)	G3G4	1	NI	Known occurrences in Madison, Pope, Sharp, Washington, and Yell Counties and St. Francis NF.
Bachman's sparrow (<i>Peucaea/Aimophila aestivalis</i>)	G3	1	NI	Mature to old growth southern pine woodland that has been subjected to fires creating a well-developed grass/herb layer with limited shrub and midstory. Occasional occupant of OSFNF.
Henslow's sparrow (<i>Ammodramus henslowii</i>)	G4	2	NI	Franklin, Benton, and Washington Counties. Ground nesters usually associated with fields interspersed with shrub.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	G5	1	NI	Winter use near Shores Lake, Mulberry River, and Frog Bayou in the BMRD.
Ozark shiner (<i>Notropis ozarcanus</i>)	G3	2	NI	High-gradient stream sections below riffles in large streams and rivers. Found in the Illinois watershed BMRD. Most abundant in the Buffalo River.
Longnose darter (<i>Percina nasuta</i>)	G3	1	NI	Silt-free upland large streams and small rivers with cobble and gravel bottoms. Illinois Bayou, Mulberry, Big Piney Creek, Illinois River. Has not been found in the Buffalo River.
Southern cavefish (<i>Typhlichthys subterraneus</i>)	G3	2	NI	Caves and springs. Has not been found in OSFNF.
William's crayfish (<i>Orconectes williamsi</i>)	G2	1	NI	Under rocks in pools from small, shallow, cool headwater streams. PHRD tributaries of Mulberry and Middle White Rivers.
Slippershell mussel (<i>Alasmidonta viridis</i>)	G4G5	2	NI	Ozark highlands ecoregion, Buffalo and White Rivers
Western fanshell mussel (<i>Cyprogenia aberti</i>)	G2G3Q	2	NI	St. Francis NF, Stone County, Van Buren County, Newton County (Buffalo and White Rivers) Dardanelle reservoir.
Purple lilliput mussel (<i>Toxolasma lividum</i>)	G3Q	2	NI	Present in Mulberry River and Lower Frog Bayou.
Boston Mountains crayfish (<i>Cambarus causeyi</i>)	G2	1	NI	Endemic. Franklin, Johnson, Madison, Newton, Pope, Searcy, Stone, and Van Buren Counties. Upper White, Buffalo, Mulberry, Upper Mulberry, and Illinois Rivers; Spadra, Little Piney, and Big Piney Creeks.
Nearctic paduniellan caddisfly (<i>Paduniella nearctica</i>)	G1?	1	NI	Creeks to medium rivers. Crawford, Johnson, Stone, and Searcy Counties. Buffalo River National Park. Pleasant Hill and Sylamore Ranger Districts. Little Red River. Distribution not well known.
Monarch butterfly (<i>Danaus plexippus</i>)	G4	1	NI	Widespread, migratory, breeds in milkweed.

Species	Status	OSFNF Presence	Impact Finding	Comments
Regal fritillary (<i>Speyeria idalia</i>)	G3	2	NI	Large (50+ acres) grasslands and prairies. Washington and Benton Counties. Habitat limited in OSFNF.
An isopod (<i>Lirceus bicuspidatus</i>)	G3Q	1	NI	Streams that have moving water. Distribution not well known.
Ouachita false indigo (also known as Ouachita leadplant) (<i>Amorpha ouachitensis</i>)	G3Q	1	NI	Open, sunlit areas with reliable soil moisture. Found on Mt. Magazine and counties of Conway, Van Buren, Johnson, Madison and others off OSFNF. Found in PHRD. Habitat present BMRD and BPRD.
Earleaf false foxglove (<i>Agalinis auriculata</i>)	G3	2	NI	Washington County and other counties off OSFNF. Potential habitat in the BMRD.
Bush's poppy-mallow (<i>Callirhoe bushii</i>)	G3	1	NI	Rocky open woods, roadsides, wooded valleys, ravine bottoms, and glade borders. Found in Benton, Carroll, Washington, Boone, Newton, Marion, Pope, Stone, Logan, Franklin, and Van Buren Counties. Potential habitat BMRD and BPRD. Present in the PHRD.
Ozark chinquapin (<i>Castanea pumila</i> var. <i>ozarkensis</i>)	G5T3	1	NI	Widespread stump sprouts. Chestnut blight is the dominant threat. Present in BMRD, BPRD, PHRD, and SRD.
Southern lady's slipper (<i>Cypripedium kentuckiense</i>)	G3	1	NI	Moist floodplains, creeks, and slopes. Boone, Johnson, Newton, Pope, and Madison Counties. Present in BPRD and PHRD. Habitat available in BMRD.
Moore's delphinium (<i>Delphinium newtonianum</i>)	G3	1	NI	Light to heavy shaded mostly hardwood woodland. Found in Newton, Searcy, Pope, Van Buren, and Johnson Counties of OSFNF. Present in BPRD and PHRD. Habitat available in BMRD.
Glade larkspur (<i>Delphinium treleasei</i>)	G3	1	NI	Limestone glades or exposures and bald knobs in north and northwest Arkansas, including Benton, Boone, Stone and Washington Counties. Found on SRD
Open-ground draba (<i>Draba aprica</i>)	G3	1	NI	Thin soils with at least partial sun such as glades and open areas. Reported in Stone and Washington Counties, and other counties off OSFNF. Found on SRD.
Small-headed pipewort (<i>Eriocaulon koernickianum</i>)	G2	1	NI	Found near moist to wet areas such as sandstone glade seeps, bogs, and prairie stream banks. Found in Conway, Franklin, Van Buren, Pope, Johnson, and Madison Counties. Found in BMRD, PHRD, and BPRD.
Butternut (<i>Juglans cinerea</i>)	G3G4	1	NI	Rich woods along base of slopes or bluffs and along streams. Newton, Baxter, and Stone Counties and other counties off OSFNF. Found on SRD.
Alabama snow-wreath (<i>Neviusia alabamensis</i>)	G2	1	NI	Steep, rocky, wooded sites or riverbanks. Newton, Pope, Conway, Searcy, and Faulkner Counties. Found in BPRD, potential habitat in PHRD.
Mapleleaf oak (<i>Quercus acerifolia</i>)	G1	1	NI	Open woods, ledges and cliff edges, and rocky edges of plateaus. Pope County and Mt. Magazine.
Bay starvine (<i>Schisandra glabra</i>)	G3	2	NI	with clean forest floors with few shrubs in mid- or understory. Typically occurs in heads of ravines. Woods developed on steep slopes. St. Francis NF.
Ovate-leaf catchfly (<i>Silene ovata</i>)	G2G3	1	NI	Talus slopes beneath a sandstone bluff line. Newton, Pope, Crawford, Benton, Stone, Baxter, and Van Buren Counties. Found in BPRD and SRD.

Species	Status	OSFNF Presence	Impact Finding	Comments
Royal catchfly (<i>Silene regia</i>)	G3	1	NI	Tall grass prairie. Searcy, Washington, Madison, Newton, and Benton Counties. Found on BMRD and SRD.
Ouachita Mountain goldenrod (<i>Solidago ouachitensis</i>)	G3	2	NI	Moist, well-drained, gravelly soils in shaded, north-facing slopes. Ouachita Mountains.
Ozark spiderwort (<i>Tradescantia ozarkana</i>)	G3	1	NI	Mainly deciduous woodlands. Boone, Madison, Franklin, Johnson, Newton, Pope, and Searcy Counties. Found in BPRD, PHRD, SRD and habitat present in BMRD.
Ozark least trillium (<i>Trillium pusillum</i> var. <i>ozarkanum</i>)	G3T3	1	NI	Acid cherty-flinty soils. Madison, Newton, Washington, Benton, and Searcy Counties. Limestone glades and bald knobs in the White River region. Habitat in OSFNF is limited.
Church's wild rye (<i>Elymus churchii</i>)	G2G3	2	NI	Bluffs of the Buffalo River in Newton County and Benton County. Potential habitat in OSFNF.
Creeping St. John's wort (<i>Hypericum adpressum</i>)	G3	3	NI	Occurs in counties south of the Ozark NF.
Largeleaf grass of Parnassus (<i>Parnassia grandifolia</i>)	G3	2	NI	Baxter, Stone, Izard Counties. Calcareous wet areas.
Nuttall's cornsalad (<i>Valerianella nuttallii</i>)	G1G2	2	NI	Stream bottoms in mixed hardwood stands. Crawford, Franklin, Pope, and Conway Counties and other counties to the south. Has not been found in OSFNF.
Ozark cornsalad (<i>Valerianella ozarkana</i>)	G3	1	NI	Sunny openings in deciduous woods, sandstone and limestone glades, and roadside ditches. Stone, Baxter, Izard, Marion, Franklin, Benton, Johnson, Madison, Newton, Pope, Searcy, Van Buren, and Washington Counties. Limited habitat for this species in OSFNF.
Magazine Mountain shagreen (<i>Inflectarius magazinensis</i>)	Delisted – June 14, 2013	1	NI	This snail occurs in restricted habitat on Mt. Magazine. Status changed to Sensitive Species.

Note: BMRD = Boston Mountain Ranger District; BPRD = Big Piney Ranger District; MMRD = Magazine Mountain Ranger District; PHRD = Pleasant Hill Ranger District; SRD = Sylamore Ranger District; NF = National Forest; OSFNFs = Ozark–St. Francis National Forests; RFSS = Regional Forester's sensitive species; ROW = right-of-way.

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Rank Qualifiers: Q = Questionable Taxonomy – Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority; ? = Inexact Numeric Rank – Denotes some uncertainty about the numeric rank (e.g. G3? – Believed most likely a G3, but some chance of either a G2 or G4); T# = Intraspecific Taxon (trinomial) – The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the global rank. Rules for assigning T-ranks follow the same principles for global conservation status ranks.

OSFNF Presence Codes: 1 = Species is known to occur in the OSFNF; 2 = Species is not known to occur on OSFNF managed lands, but has suitable habitat within OSFNF and a known distribution which makes occurrence possible; 3 = Species does not occur on OSFNF managed lands and is not likely to occur there due to habitat requirements or geographic distribution.

Effects determination; NI = No Impact; BI = Beneficial Impact; MIIH = May impact individuals or habitat but will not cause a trend toward listing